A

Synopsis entitled

“Design And Development of Multi-Modal System for Detection of Psychological Disorders Using Soft Computing Approach”

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“Design And Development of Multi-Modal System for Detection of Psychological Disorders Using Soft Computing Approach”

ABSTRACT:

The detection and diagnosis of psychological disorders are critical aspects of mental healthcare, which require efficient, accurate, and non-invasive methods. Psychological disorders are conditions that significantly disrupt an individual’s thoughts, feelings, behaviors and overall functioning. A key component involves a psychological evaluation, where mental health professionals assess a person's thoughts, feelings, and behaviors, often using questionnaires and observations. This proposed work aims to design and develop a multi-modal system that can detect various psychological disorders, such as depression, anxiety, schizophrenia, bipolar, anxiety, autism, by integrating data from diverse sources like text, voice, facial expressions, and physiological signals. The system will utilize advanced machine learning and signal processing techniques to analyze these multi-modal data and offer a holistic approach to understanding an individual's mental state.

The proposed multi-modal system will combine various modalities: machine learning, Natural Language Processing (NLP) for analyzing verbal responses and textual data; speech analysis to detect emotional states through vocal tone, pitch, and cadence; facial expression recognition to assess non-verbal cues associated with mental health; and physiological data (e.g., heart rate, skin conductivity) to monitor physiological responses indicative of psychological stress or disorders. By processing and synthesizing these data, the system aims to provide a comprehensive assessment of the subject's psychological condition.

Machine learning algorithms, such as neural networks and support vector machines, will be employed to train the system on large datasets containing both clinical data and real-world signals. This system will be designed to detect early signs of psychological disorders and offer real-time feedback. It will also allow for continuous monitoring, enabling early intervention and personalized treatment recommendations.

Ultimately, this multi-modal system will serve as a tool for healthcare providers, enabling more accurate and timely diagnosis of psychological

disorders, while also reducing the stigma and subjectivity often associated with traditional mental health assessments.

INTRODUCTION

Psychological disorders, such as depression, anxiety, and schizophrenia, have become a significant concern in modern society, affecting millions of people worldwide. The early detection and accurate diagnosis of these disorders are crucial to improve treatment outcomes and enhance patients' quality of life. Traditional diagnostic methods, while effective, often rely on subjective assessment through interviews, self-reporting, or clinician observations. However, these methods can sometimes be unreliable, time-consuming, and prone to bias.

Most current methods introduced by hospitals or other organizations rely on clinical procedures to forecast mental disease. This traditional method depends on surveys to identify the underlying psychological problem causing depression. Clinical psychology research reveals links between words spoken or written by depressed people and their language usage.

One promising approach is the use of multi-modal systems, which combine data from various sources such as audio, physiological, and textual signals like shown in Fig 1. These systems offer a more comprehensive and objective analysis of the individual's mental health status. Additionally, soft computing techniques, such as fuzzy logic, genetic algorithms, neural networks, and support vector machines, can be applied to process the complex, noisy, and non-linear data from these diverse modalities, making it easier to identify patterns and classify psychological disorders.

Fig 1

Depressive disorder, sometimes known as depression, is a prevalent illness. From the World Health Organization (WHO) considerations, this mental illness can negatively impact one's ability to function in any place, and it can even cause self-harm. [1]

Psychological disorders are complex conditions that affect an individual's emotions, thinking, behavior, and overall well-being. Early detection and effective diagnosis are crucial for improving patient outcomes and providing timely interventions. Traditional methods of diagnosis, such as clinical interviews and psychological tests, often require expert evaluation and may be subjective or time-consuming. To address these challenges, the integration of advanced technological approaches is emerging as a promising solution. One such approach is the design and development of multi-modal systems that leverage soft computing techniques for the detection of psychological disorders.

1. Motivation and Need:

The traditional diagnostic process for psychological disorders is often subjective, relying on the clinician's interpretation of patient responses. This can lead to misdiagnoses, delayed treatments, and reduced accessibility for patients, especially in remote areas. By leveraging multi-modal systems powered by soft computing techniques, it becomes possible to provide objective, reliable, and real-time assistance for diagnosing psychological disorders.

These systems offer several advantages:

Improved Accuracy: Combining multiple types of data (speech, Text, physiological signals) allows for a more accurate and nuanced understanding of the individual's psychological state.

Personalization: Soft computing techniques enable systems to adapt to the unique characteristics of each individual, making the detection process more personalized and tailored to specific needs.

Real-time Monitoring: Continuous data collection (such as through wearable sensors or smartphone applications) allows for ongoing monitoring and early detection of any psychological disturbances.

2. **LITERATURE REVIEW**

Sr no	Author	Paper Title	Review/ Theme
1	Amna Amanat [1], Muhammad Rizwan[1,*], AbdulRehman Javed[2,] Maha Abdelhaq [3], RaedAlsaqour [4, *], Sharnil Pandya [5] and Mueen Uddin [6]	Deep Learning for Depression Detection from Textual Data	Amna Amanat et al focused-on data was segmented, stemmed and lemmatized of the normalization process. The next step to pass the data to machine learning classifiers. Author evaluated the results with classification metrics.
2	Sri Mulyana Sri Hartati Retantyo Wardoyo Subandi	A Processing Model Using Natural Language Processing (NLP) For Narrative Text of Medical Record For Producing Symptoms of Mental Disorders	Sri Mulyana et al developed the *Clinical Decision Support Systems* (CDSS) software. With that software sentences were processed through the stage of scanning by determining words characterizing the symptoms found in them. Furthermore, parsing and extraction of keywords were conducted by matching each token with corpus specific to the characteristic of mental Disorder.
3.	Vankayala Tejaswini* Korra Sathya Babu Bibhudatta Sahoo	Depression Detection from Social Media Text Analysis using Natural Language Processing Techniques and Hybrid Deep Learning Model	Vankayala Tejaswini et al proposed standard Natural language prepossessing techniques. Eliminating extraneous data from data

			with extracted data convert into numerical from using techniques like word embedding, after apply multiple model that concluded the depression.
4.	Himani Negi 1 , Tanish Bhola2 , Manu S Pillai 3 , Deepika Kumar4	A Novel Approach for Depression Detection using Audio Sentiment Analysis	Himani Negi et al were first researcher to present the depression level with audio, speech dataset to extract valuable feature from prepared audio file. i.e. prosodic feature.
5	Xiangsheng Huang1,2, FangWang1,2, YuanGao1,2, Yilong Liao1, Wenjing Zhang1, Li Zhang1* & Zhenrong Xu1	Depression recognition using voice-based pre-training model	Zhou et al. employed a time-aware attention multimodal fusion network (TAMFN) for depression detection. Li et al. utilized CNN Asynchronous Federated optimization (CAFed) for depression detection.
6	Amna Amanat 1 , Muhammad Rizwan 1,*, Abdul Rehman Javed 2 , Maha Abdelhaq 3 , Raed Alsaqour 4,*, Sharnil Pandya 5 and Mueen Uddin 6	Deep Learning for Depression Detection from Textual Data	Amna Amanat et al introduced methodology starts with data collection. We obtained an extensive unbalanced data set of tweets from the Kaggle website. The data were passed into machine-learning classifiers

			to predict depressed and non-depressed text tweets.
7	Liana Spytska *Department of Psychology and Pedagogy*,	Anxiety and depressive personality disorders in the modern world	Liana Spytska et al these methods contributed to data collection, analysis, and generalization of information, which allowed us to better understand the nature of anxiety and depressive disorders, their prevalence in different age groups, and the effectiveness of various methods of treatment and prevention of these disorders.
8	Barnaly Rashid1 | Vince Calhoun2	Towards a brain-based peristome of mental illness	Barnaly Rashid1 et al proposed to detect mental illness. after feature extraction and selection, a classifier is trained in a supervised or semi-supervised way with a predefined set of labels. Further model validation is performed either using an independent testing dataset or by incorporating a cross-validation (CV) scheme.

OBJECTIVES OF THE STUDY

This research proposal is mainly designed to provide efficient and early detection of psychological disorder by doctor with different type of input. This research also helps to solve the problem related to human behavior.

1. To study the existing psychological disorder system.
2. To study the different parameters responsible for psychological disorder.
3. To device an algorithm for extraction of features from various type of Data Input.
4. To Establish a Network / system for classification of a psychological disorder.
5. To compared the obtained result with existing system.

5.PROPOSED METHODOLOGY

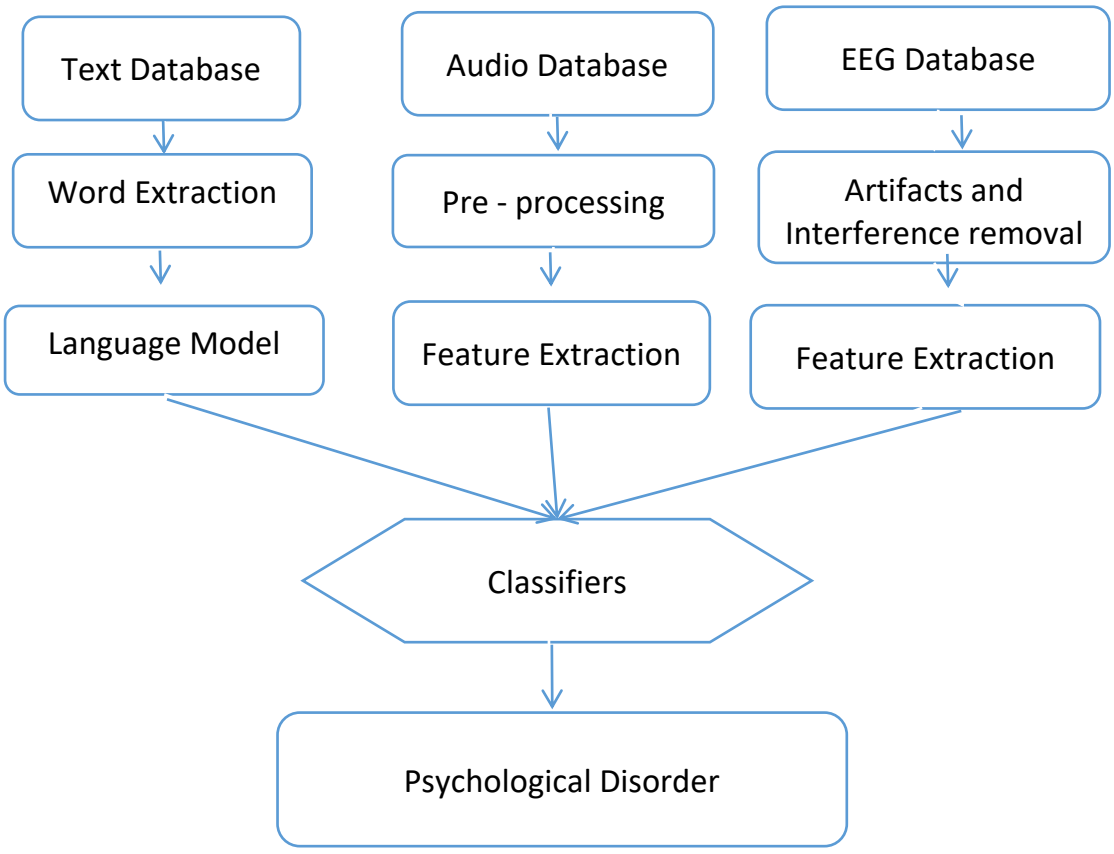

Fig 2

Proposed Research Methodology according Fig 2 following Phases / Steps……

The proposed research is focused on developing accurate diagnosis mental health. With the other diseases can diagnosis through with blood test or any x-ray

or with other test on body but the mental issue is difficult to diagnosis. So, in this proposed method to try early detection of mental health with following different input:

Text / Audio / EEG Database:

At the first stage of the methodology collect the dataset from different source like Kaggle. In dataset some questionnaire or opinion or thoughts of some human. those datasets are trusted.

Audio data is a rich source of information that can be leveraged for advanced machine learning applications. By analyzing audio signals, models can learn to identify patterns and make predictions related to speech recognition, music classification, and sound event detection.

The electroencephalogram (EEG) is a medical test used to measure the electrical activity of the brain. A number of electrodes are applied to your scalp. EEG can help diagnose a number of conditions including epilepsy, sleep disorders and brain tumor.

Word Extraction:

Text prepossessing is a crucial step in Natural Language Processing (NLP) that involves cleaning and transforming raw text data into a format suitable for analysis and machine learning models. This process is vital for enhancing the performance and accuracy of NLP tasks.

One key reason for text prepossessing is to remove noise and irrelevant information from the text, such as special characters, punctuation, and stop words. This helps in reducing the dimensional of the data and improves the efficiency of subsequent analysis. Additionally, text normalization techniques, such as stemming and lemmatization, ensure that words are represented in their base or root form, reducing redundancy and enhancing the consistency of the dataset's.

Language Model:

Language Modeling is a technique used in natural language processing (NLP) that involves predicting the next word in a sentence or sequence of words based on the context and previous words. It helps in understanding the structure, grammar, and meaning of a given text. Language Modeling is typically achieved using deep learning algorithms, such as recurrent neural networks (RNNs) or transformer models. These models are trained on large datasets containing text from various sources. The training involves exposing the model to the input text

and optimizing its parameters to make accurate predictions about the next word or sequence of words in a given context.

Artifacts and Interference removal:

The primary objective of this work is to remove artifacts from EEG using an EEG, a LSTM-based GAN deep model. The goal was to enable the GAN to generate pure EEG signals that maintain the original neural activity data by training the model on a variety of datasets containing EEG recordings with various artefact.

Feature Extraction:

Feature extraction refers to the process of transforming raw data into numerical features that can be processed while preserving the information in the original data set. It yields better results than applying machine learning directly to the raw data.

Classification:

A classification algorithm is a categorization-focused machine learning algorithm that sorts input data into different classes or categories. Artificial intelligence (AI) models use classification algorithms to process input datasets against a specified classifier that sets the criteria for how the data should be sorted. Classification algorithms are widely used in data science for forecasting patterns and predicting outcomes.

Psychological Disorder:

There are many different types of mental disorders, like Anxiety, Depression, Bipolar, so on. With this proposed method conclude the problem which will help to doctor.

6. SIGNIFICANCE OF STUDY

Significance of the Study on the Design and Development of a Multi-Modal System for Detection of Psychological Disorders:

The proposed study holds substantial significance in the context of advancing mental health diagnostics, improving healthcare systems, and providing better access to psychological support. The key contributions and impacts of this research include:

Early Detection of Psychological Disorders: Early detection of mental health conditions like depression, anxiety, and schizophrenia is often challenging due to the subtle and complex nature of their symptoms.

Proposed work

Phases	Plan of work	Duration in Months					
		1-6	7-12	13-18	19-24	25-30	31-36
Phase I	Review of Literature	⟷					
Phase II	Study of existing Methodology	⟷					
Phase III	Database collection			⟷			
Phase IV	Design and Development of Multi Model system				⟷		
Phase V	Result and Conclusion					⟷	
Phase VI	Report writing					⟷	

⟷ **Arrow indicates the duration in months**

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